UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/553,990	04/20/2000	Youhao Xu	456962000200	5903

25226 7590 08/17/2004

MORRISON & FOERSTER LLP
755 PAGE MILL RD
PALO ALTO, CA 94304-1018

EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 08/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/553,990	XU ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 25, 2004 has been entered.

Response to Amendment

2. Applicant's amendment submitted on May 25, 2004 has been received and carefully considered. Claims 9-48 are newly added. Claims 1-48 remain active.

Claim Objections

3. Claims 17, 28 and 33 are objected to because of the following informalities:

– In claim 17, lines 7-8 and 12, "taking place" should be changed to -- takes place --.

– In claim 28, in the last line, the second period "." should be deleted.

– In claim 33, in the last line of section d.), the second use of "and" should be deleted.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 6, 8 and 17-48 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 2, 6, 8, 18, 22, 24, 26, 30, 32, 42, 46 and 48, additional limitations to "said outlet zone" lack proper positive antecedent basis, as the riser reactor set forth in claim 1 or claim 17 includes the embodiment of having no outlet zone (i.e., the zone being "optional"). The Examiner suggests including a positive limitation that the outlet zone is included in the riser reactor (i.e., not optional) prior to reciting further limitations to the structure of the outlet zone.

Regarding claim 17, "the second reaction zone" in line 1 of section c.) lacks proper positive antecedent basis.

Regarding claim 25, it is unclear as to the relationship between each structural element as recited in the process steps and the structural elements of the riser reactor set forth in claim 1. For example, it is unclear as to the relationship between, "a first reaction zone", "a first reaction zone diameter" and "a first reaction zone height" as recited in process step c.), and "a first reaction zone", "a first reaction zone diameter", and "a first reaction zone height" as set forth in the riser reactor of claim 1.

Regarding claims 26-32, the step of, "providing the reactor system of claim 1", lacks proper positive antecedent basis, as the step of, "providing the riser reactor of claim 1", is set forth in claim 25. Additionally, to eliminate any confusion of multiple claim dependency of said claims from both claims 25 and 1, the Examiner suggests deleting the phrase "of claim 1".

Regarding claim 33, it is unclear as to the relationship between each structural element as recited in the process steps and the structural elements of the riser reactor set forth in claim 9. For example, it is unclear as to the relationship between, "a first reaction zone", "a first reaction zone diameter" and "a first reaction zone height" as recited in process step c.), and "a first reaction zone", "a first reaction zone diameter", and "a first reaction zone height" as set forth in

the riser reactor of claim 9.

Regarding claims 34-40, the step of, "providing the reactor system of claim 9", lacks proper positive antecedent basis, as the step of, "providing the riser reactor of claim 9", is set forth in claim 33. Additionally, to eliminate any confusion of multiple claim dependency of said claims from both claims 33 and 9, the Examiner suggests deleting the phrase "of claim 9".

Regarding claim 41, it is unclear as to the relationship between each structural element as recited in the process steps and the structural elements of the riser reactor set forth in claim 17. For example, it is unclear as to the relationship between, "a first reaction zone", "a first reaction zone diameter" and "a first reaction zone height" as recited in process step c.), and "a first reaction zone", "a first reaction zone diameter", and "a first reaction zone height" as set forth in the riser reactor of claim 17.

Regarding claims 42-48, the step of, "providing the reactor system of claim 17", lacks proper positive antecedent basis, as the step of, "providing the riser reactor of claim 17", is set forth in claim 41. Additionally, to eliminate any confusion of multiple claim dependency of said claims from both claims 41 and 17, the Examiner suggests deleting the phrase "of claim 17".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Cartmell.

Cartmell (see FIGURE; column 2, lines 40-66; column 9, lines 27-40) discloses a riser reactor **10** comprising a reactor bottom and further comprising, in order from the reactor bottom,

a) a prelift zone **10a** having a prelift zone diameter and a prelift zone height and containing catalytic cracking catalyst (i.e., as introduced from standpipe **7**);

b) a first reaction zone **10b** having a first reaction zone diameter and a first reaction zone height and containing catalytic cracking catalyst (i.e., from upward flow from zone **10a**);

c) a second reaction zone **10c** having a second reaction zone height and a second reaction zone diameter that is larger than the first reaction zone **10b** diameter and containing catalytic cracking catalyst (i.e., from upward flow from zone **10b**); and

d) an outlet zone (i.e., exit line **12**, communicating with dead space **11**) having an outlet zone diameter that is reduced with respect to the second reaction zone **10c** diameter (see column 4, lines 17-23, see FIG.).

Cartmell (column 2, lines 42-65) further discloses a process of conducting a hydrocarbon cracking reaction using riser reactor **10**, above, wherein the process comprises the steps of:

a) providing said riser reactor **10**;

b) passing catalytic cracking catalyst from standpipe **7** into the prelift zone **10a**;

c) passing the hydrocarbon feed from gas oil inlet **2** and cracking catalyst from the prelift zone **10a** to the first reaction zone **10b** to produce a first reaction zone product containing cracking catalyst, hydrocarbon feed, and cracked hydrocarbon product;

d) passing the product from the first reaction zone **10b** to the second reaction zone **10c** to produce a second reaction zone product containing cracking catalyst, hydrocarbon feed, and cracked hydrocarbon product; and

e) passing the product from the second reaction zone **10c** to the outlet zone **12**.

Instant claims 1 and 25 read on the apparatus and process of Cartmell.

6. Claims 1, 2, 17, 18, 25, 26, 41 and 42 are rejected under 35 U.S.C. 102(b) as being anticipated by Skraba (US 4,681,743).

Regarding claims 1, 17, 25 and 41, Skraba (FIG. 1, 2; TABLE in column 8; column 4, line 58 to column 5, line 21) discloses a riser reactor **4** comprising, in order from the bottom,

a) a prelift zone (i.e., lift pot **37**; FIG. 2) having a prelift zone diameter and a prelift zone height (see TABLE, line (50)) and containing cracking catalyst (i.e., from line **38**);

b) a first reaction zone (i.e., first generally cylindrical portion **82**) having a first reaction zone diameter and a first reaction zone height (see TABLE, line (4)(a)); wherein said first reaction zone **82** contains a cracking catalyst (i.e., supplied from prelift zone **37**) for conducting a hydrocarbon cracking reaction (i.e., on a oil feedstock supplied by line **44**);

c) a second reaction zone (i.e., second generally cylindrical portion **84**) having a second reaction zone height and a second reaction zone diameter larger than the first reaction zone diameter (FIG. 1, 2 and TABLE, lines (4)(a), (c)) and containing cracking catalyst for conducting a hydrocarbon cracking reaction (i.e., supplied from the first reaction zone **82**); wherein the ratio of the second reaction zone **84** diameter to the first reaction zone **82** diameter is in the range of from about 1.5:1 to about 5:1 (i.e., "... the diameter of the second generally cylindrical portion of the riser will be in the range of from *about 1.1 to about 2 times* the diameter of the riser at the mouth," column 5, lines 11-21).

Skraba (column 2, line 57 to column 3, line 20) further discloses a corresponding process of conducting a hydrocarbon cracking reaction on the hydrocarbon feed using the riser reactor **4** as disclosed, above, wherein the process comprises the steps of:

a) providing said riser reactor **4** above;

b) passing the catalyst via line **38** into prelift zone **37** (column 4, lines 38-57);

c) passing the hydrocarbon feed from line **44** and catalyst from the prelift zone **37** to the first reaction zone **82** to produce the first reaction zone product containing cracking catalyst, hydrocarbon feed, and cracked hydrocarbon product; and

d) passing the first reaction zone product from the first reaction zone **82** to the second reaction zone **84** to produce the second reaction zone product containing catalyst, hydrocarbon feed, and cracked hydrocarbon product.

Regarding claims 2, 18, 26 and 42, Skraba discloses an exemplary commercial catalytic cracker (see TABLE, column 8) wherein the total height of the prelift zone **37** (i.e., about 72 in.), first reaction zone **82** (i.e., about 4 ft.) and second reaction zone **84** (i.e., about 103 ft., 9 in.) in the riser reactor **4** (i.e., without an optional outlet zone) is within the range of about 10 to about 60 meters (i.e., calculates to a total height of about 114 feet, or 35 meters).

Instant claims 1, 2, 17, 18, 25, 26, 41 and 42 read on the apparatus and process of Skraba.

7. Claims 1 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Williams et al. (US 4,422,925).

Williams et al. discloses a riser reactor **2** comprising a reactor bottom and further comprising, in order from the reactor bottom,

a) a prelift zone (i.e., reactor section **9**) having a prelift zone diameter and a prelift zone height and containing catalytic cracking catalyst (i.e., fed from standpipe **6**);

b) a first reaction zone (i.e., reaction section **10**) having a first reaction zone diameter and a first reaction zone height and containing cracking catalyst (i.e., fed from zone **9**); and

c) a second reaction zone (i.e., reaction section **11**) having a second reaction zone height

and a second reaction zone diameter that is larger than the first reaction zone diameter (column 3, lines 26-29; Figure) and containing catalytic cracking catalyst (i.e., fed from zone **10**).

Williams et al. further discloses a corresponding process of conducting a hydrocarbon cracking reaction on the flowing stream of hydrocarbons using the riser reactor **2** as disclosed, above, wherein the process comprises the steps of:

a) providing said riser reactor **2**;

b) passing catalytic cracking catalyst from the regenerator **5** via standpipe **6** into the prelift zone (column 2, line 66 to column 3, line 15);

c) passing catalytic cracking hydrocarbon feed (i.e., naptha feed **14**) and catalytic cracking catalyst from the prelift zone **9** to the first reaction zone **10** to produce a first reaction zone product containing catalytic cracking catalyst, catalytic cracking hydrocarbon feed, and cracked hydrocarbon product (column 3, lines 38-53); and

d) passing the first reaction zone product from the first reaction zone **10** to the second reaction zone **11** to produce a second reaction zone product containing cracking catalyst, hydrocarbon feed, and cracked hydrocarbon product (column 3, lines 53-56).

Instant claims 1 and 25 read on the apparatus and process of Williams et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 2-5, 7, 17-21, 23, 26-29, 31, 41-45 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 4,422,925).

Regarding claims 17 and 41, the same comments with respect to Williams et al. apply (see claims 1 and 25 above). Additionally, Williams et al. (column 4, lines 21-29) discloses that,

> "In each of the reactor sections **9**, **10**, **11** and **12**, reaction conditions suitable for substantially optimum conversion of the various hydrocarbon feedstreams introduced into the successive sections of the riser reactor to the desired products may be obtained by variations in vapor velocity, catalyst loading, feed preheats, and regenerator temperature. The length and diameter of the various sections of reactor **2** are proportioned to maintain a desired reaction time in each section."

However, Williams et al. is silent as to the diameter ratio of the second reaction zone **11** to the first reaction zone **10** being specifically in the range of from about 1.5:1 to about 5:1. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate diameter ratios for the second reaction zone **11** relative to the first reaction zone **10** in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise diameter ratio would have been considered a result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter of the second reaction zone **11** relative to the diameter of the first reaction zone **10** in the apparatus and process of Williams et al. in order to obtain the desired reaction conditions within each zone

for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 2, 18, 26 and 42, the same comments with respect to Williams et al. apply (see claims 17, 41 and column 4, lines 21-29). However, Williams et al. is silent as to the total height of prelift zone **9**, first reaction zone **10** and second reaction zone **11** being in the range of about 10 to about 60 meters (the outlet zone being optional). In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriates heights for the respective zones in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise zone heights would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the heights of the prelift zone **9**, first reaction zone **10** and second reaction zone **11** in the apparatus and process of Williams et al. in order to obtain the desired reaction conditions and reaction time within each zone for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 3, 19, 27 and 43, the same comments with respect to Williams et al. apply (see claims 17, 41 and column 4, lines 21-29). However, Williams et al. is silent as to the diameter of the prelift zone **9** being in the range of about 0.02 to about 5 meters, and the prelift

zone **9** height being the range of about 5% to about 10% of the height of the riser reactor. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions for the prelift zone **9** in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise dimensions would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter and height of the prelift zone **9** relative to the dimensions of the riser reactor in the apparatus and process of Williams et al. in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 4, 20, 28 and 44, the same comments with respect to Williams et al. apply (see claims 17, 41 and column 4, lines 21-29). However, Williams et al. is silent as to the ratio of the first reaction zone **10** diameter to the prelift zone **9** diameter being from about 1:1 to about 2:1, and the height of the first reaction zone **10** being from about 10% to about 30% of the height of the riser reactor **2**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions for the first reaction zone **10** in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise dimensions would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one

having ordinary skill in the art would have routinely optimized the diameter of the first reaction zone **10** relative to the diameter of the prelift zone **9**, and the height of the first reaction zone **10** relative to the height of the riser reactor **2,** in the apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 5, 21, 29 and 45, the same comments with respect to Williams et al. apply (see claims 17, 41 and column 4, lines 21-29). However, Williams et al. is silent as to the ratio of the second reaction zone **11** diameter to the first reaction zone **10** diameter being in the range of from about 1.5:1 to about 5:1, and the height of the second reaction zone **11** being in the range of from about 30% to about 60% of the height of the riser reactor **2**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions for the second reaction zone **11** in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise dimensions would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter of the second reaction zone **11** relative to the diameter of the first reaction zone **10**, and the height of the second reaction zone **11** relative to the height of the riser reactor **2,** in the apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum

conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 7, 23, 31 and 47, the same comments with respect to Williams et al. apply (see claims 17, 41 and column 4, lines 21-29). Williams et al. further illustrates a first junction section (not labeled, see Figure) located between the first reaction zone **10** and the second reaction zone **11**, wherein the first junction section has a circular truncated cone shape. However, Williams et al. is silent as to the first junction section defining a vertical section vertex angle with respect to the reactor axis in the range of about 30 to 80 degrees. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate vertex angle for the first junction section in the apparatus and process of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise angle would have been considered result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the vertex angle of the first junction section relative to the dimensions of the first and second reaction zones **10**, **11** in the apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

9. Claims 6, 8-16, 22, 24, 30, 32-40, 46 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 4,422,925) in view of Myers et al. (US 4,070,159).

Regarding claims 9 and 33, the same comments with respect to Williams et al. apply (see claims 1 and 25 above). Williams et al. further discloses that the hydrocarbon cracking reaction occurs at a higher reaction temperature and higher ratio of catalyst to oil in the first reaction zone **10** than the second reaction zone **11** (i.e., "The temperature and catalyst-to-oil ratio decrease progressively in subsequent sections of the reactor as the heavier hydrocarbon charge stocks are introduced into the reactor," column 2, lines 40-45). Additionally, Williams et al. (column 4, lines 21-29) discloses that,

> "In each of the reactor sections **9**, **10**, **11** and **12**, reaction conditions suitable for substantially optimum conversion of the various hydrocarbon feedstreams introduced into the successive sections of the riser reactor to the desired products may be obtained by variations in vapor velocity, catalyst loading, feed preheats, and regenerator temperature. The length and diameter of the various sections of reactor **2** are proportioned to maintain a desired reaction time in each section."

However, Williams et al. is silent as to the length and diameter of the first reaction zone **10** being proportioned relative to the length and diameter of the second reaction zone **11** such that the first reaction zone **10** has a shorter reaction time than the second reaction zone **11**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions for the first reaction zone **10** relative to the second reaction zone **11** in the riser reactor of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise dimensions would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter and height of the

first reaction zone **10** relative to the diameter and height of the second reaction zone **11** in the apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the respective zones for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Williams et al. further discloses the riser reactor **2** comprises an outlet zone (i.e., as illustrated in the Figure, the discharge end of zone **12** of riser **2**, communicating with cyclone separator **13**; column 4, lines 30-33), wherein the process additionally comprises the steps of passing the second reaction zone stream from the second reaction zone **11** to the outlet zone. However, Williams et al. is silent as to the outlet zone being configured with a reduced outlet zone diameter with respect to the second reaction zone **11** diameter.

Myers et al. teaches a riser reactor comprising a riser tube **10** having a discharge end comprising a conical neck or restrictor section in the riser, as indicated by the step-down section at **32** in FIG. 3, situated just upstream of sidewise ports **17** of lateral conduit **18**. It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the outlet zone of the riser reactor **2** in the apparatus and process of Williams et al. as instantly recited, on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the provision of a restricted section, which increases the transport velocity of the product stream at the discharge end of the riser, enhances the separation of catalyst particles from the gas stream, as taught by Meyers et al. (see column 4, lines 20-31; FIG. 3).

Regarding claims 6, 14, 22, 30, 38 and 46, the same comments with respect to Williams et al. and Meyers et al. apply. However, their collective teachings are expressly silent as to the ratio of the outlet zone diameter to the first reaction zone **10** diameter being in the range of from about 0.8:1 to about 1.5:1, and the height of the outlet zone being from about 0% to about 20% of the height of the riser reactor **2**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate outlet zone diameter relative to the first reaction zone **10** diameter, and an appropriate height of the outlet zone relative to the height of the riser reactor **2**, in the modified apparatus and process of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise dimensions for the outlet zone would have been considered result effective variables by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter of the outlet zone in proportion to the diameter of the first reaction zone **10**, and the height of the outlet zone in proportion to the height of the riser reactor **2**, in the modified apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 8, 16, 24, 32, 40 and 48, Meyers et al. teaches that the step-down section at **32** (FIG. 3) comprises a circular truncated cone shape, wherein section **32** inherently defines a second junction section between the second reaction zone **11** and the outlet zone in the

modified apparatus of Williams et al. The collective teaching, however, is silent as to the cone having a vertical section vertex angle with respect to the reactor axis in the range of about 45 to 85 degrees. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate vertex angle for the second junction section in the modified apparatus and process of Williams et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise angle would have been considered result effective variable by one having ordinary skill in the art. Thus, one having ordinary skill in the art would have routinely optimized the vertex angle of the second junction section relative to the dimensions of the first and second reaction zones **10**, **11** in the apparatus and process of Williams et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10 and 34, the same comments with respect to Williams et al. apply (see claims 2, 18, 26 and 42 above).

Regarding claims 11 and 35, the same comments with respect to Williams et al. apply (see claims 3, 19, 27 and 43 above).

Regarding claims 12 and 36, the same comments with respect to Williams et al. apply (see claims 4, 20, 28 and 44 above).

Regarding claims 13 and 37, the same comments with respect to Williams et al. apply (see claims 5, 21, 29 and 45 above).

Regarding claims 15 and 39, the same comments with respect to Williams et al. apply (see claims 7, 23, 31 and 47 above).

Response to Arguments

10. Applicant's arguments filed May 25, 2004 with respect to the rejections of claims 1-8 as being anticipated by, or obvious over, Cabrera, Weinberg et al., or Luckenbach have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the newly found prior art references, above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
August 6, 2004

Hien Tran

HIEN TRAN
PRIMARY EXAMINER